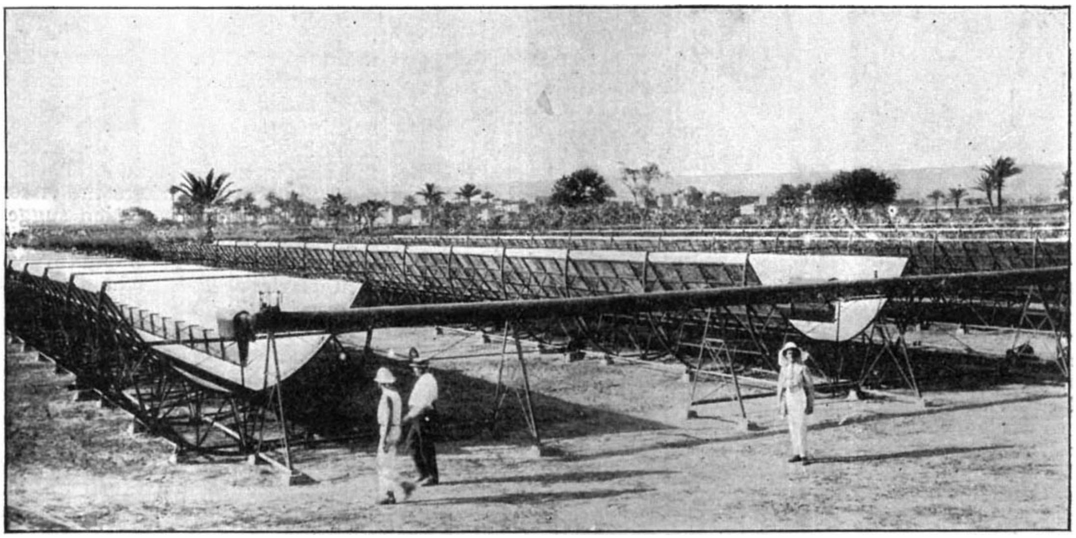
THE UTILISATION OF SOLAR ENERGY.[1]

AFTER naming the principal workers in this field, the author gives determinations of the solar constant and deals fully with the varying percentages of this quantity that are available throughout the day for power purposes. He then describes four types of Shuman sun heat absorbers and gives in great detail the results of his forty-eight trials of these absorbers, the latest pattern (that erected near Cairo, Egypt) of which gave a maximum thermal efficiency of no less than 40·7 per cent., and a maximum output of steam of 1442 lb. an hour at a pressure of 15·8 lb. per sq. in. abs. The results of these types of absorbers are compared by means of tables and curves, and from these the author has constructed a formula by means of which it is easy to calculate for a given type and size of absorber the total output of steam an hour if three things are known: (1) the time of day; (2) the humidity; and (3) the steam pressure. It has been known that humidity adversely affects the quantity of solar radiation arriving at the earth's solid surface, but this is the first time that its effect on solar steam production has been quantitatively determined.



The Meadi Absorber. Looking N.E. and showing the reflectors in the mid-day position. There are 5 reflectors each 205 ft. long, and 13 ft. 5 in. wide at the top.

The difference between the thermal efficiency of the solar boiler and the commercial value of the steam produced is ingeniously brought out, the author making it clear that in the case of such low-pressure boilers a high thermal efficiency is not necessarily the same thing as the most economical conditions of working, and he shows that, up to a certain limit, the higher the steam pressure, the more economical the working, though the thermal efficiency is then lower. Two of the types of absorber did not move with the sun, and one did. The greater constancy of output of steam in the case of the latter is very marked.

In order to utilise the low-pressure steam economically, Mr. Frank Shuman designed a special engine which has also gone through several stages. This engine is fully described with drawings, and the author gives the results of his fourteen trials of the several engines and compares their results with those of exhaust steam turbines and the low-pressure cylinders of compound- and triple-expansion engines, showing that the Shuman engine is the more economical. The steam consumption of one of these engines was only 22·1 lb. per B.H.P. hour, when the output was 94·5 B.H.P., and the steam pressure only 16·2 lb. per sq. in. abs. The thermal efficiency of the engine compared with an engine working on the Rankine cycle was 54·75 per cent. In the case of a Shuman high-pressure non-condensing engine with an output of 29 B.H.P., the steam consumption was 23·8 lb. per B.H.P. hour, and the relative thermal efficiency 71·7 per cent.

Finally the author gives the results of his trials of the complete sun power irrigation plant at Cairo, and describes his design of a special form of weir tank for measuring greatly differing quantities of water.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Dr. W. H. R. Rivers has been appointed to represent the University at the nineteenth International Congress of Americanists to be held at Washington, U.S.A., in October next.

The Special Board for Biology and Geology has nominated Dr. Shipley as the representative of the University on the council of the Marine Biological Association.

The Sudbury Hardyman prize offered for an original dissertation by a graduate member of Emmanuel College under the standing of M.A., has been awarded to Mr. G. Matthai, for a treatise entitled "A Revision of the Recent Colonial Astræidæ Possessing Distinct Corallites."

OXFORD.—The Halley Lecture in 1915 will be delivered by Dr. F. W. Dyson, F.R.S., late fellow of Trinity College, Cambridge, Astronomer Royal.

The Hon. Bertrand A. W. Russell, F.R.S., late fellow of Trinity College, Cambridge, has been elected Herbert Spencer lecturer for the year 1914–15.

The Romanes Lecture, as previously announced, will be delivered by Sir J. J. Thomson, O.M., F.R.S., on June 10, at 3 o'clock. Subject, "The Atomic Theory."

DR. C. W. CHAMBERLAIN has been inaugurated presi-

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[1] Summary of a paper read before the Society of Engineers (Incorporated) on April 6, by Mr. A. S. E. Ackermann.

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dent of Denison University, Ohio. From 1901 to 1908 Dr. Chamberlain occupied the chair of physics in that institution. Since the latter date he has held the professorship of that subject in Vassar College.

DR. B. T. GALLOWAY has resigned his position as assistant secretary of the U.S. Department of Agriculture in order to accept the post of dean of the Agricultural College of Cornell University.

THE London County Council Education Committee has had under review the scheme for the reorganisation of the council's evening school system which was adopted last winter. The object of the reorganisation was to remedy certain serious defects of enrolment, attendance, and organisation, and to infuse freshness and attractiveness into the system. Among other arrangements made was a relief from fees as an award for good attendance, important changes in the *personnel* and duties of the inspectorate, and changes of a far-reaching character in the staffing, so as ultimately to obtain a separate staff for evening schools. Public attention was at the beginning of the session directed to the classes in many ways. Though a decrease of 30,000 pupils was anticipated in the total attendance, happily this was not realised. The committee is of opinion that in the main no change in the fundamental principles of the organisation appears to be advisable. Extension of the main features of the organisation are recommended, and some modifications of detail are suggested. It is proposed in a few instances to convert free schools into fee-paying under the ordinary conditions. The most important proposal, however, is to charge a registration fee of sixpence at all "free" institutes. It is felt that the immediate outlay of sixpence on joining an institute will be some guarantee that the student is serious, while it will not really interfere with the "free" character of the schools. The committee proposes to make provision for 120,000 students in these classes next year.

SOCIETIES AND ACADEMIES.

LONDON.

Zoological Society, May 19.—Mr. R. H. Burne, vice-president, in the chair.—Dr. C. H. **O'Donoghue**: The venous system of the dogfish. The general disposition of the main trunks in Scyllium is similar to that described in other Elasmobranchs, but the details differ considerably.—B. F. **Cummings**: Scent-organs in Trichoptera. An account of the remarkable development of the palpi of the first maxilla in a male caddis-fly, *Sericostoma personatum.* Instead of being 5-segmented, the palpus consists of a single swollen segment carrying an enormous tuft of long, silky hairs, at the bases of which unicellular scent-glands are situated.—H. A. **Baylis**: A new species of Cestode collected from an albatross (*Diomedea irrorata*) by Dr. H. O. Forbes in Peru.—D. M. S. **Watson**: The Deinocephalia, an order of mammal-like reptiles. The skull of a Tapinocephaloid is almost completely described. The fact that whilst in the skull Deinocephalia agree with the American Pelycosaurs, but in the post-cranial skeleton they resemble South African Therapsids, shows that the American forms must be included in the same great group, super-order, as the South African mammal-like reptiles.—Dr. R. C. L. **Perkins**: Species of the genus Paralastor and some other Hymenoptera of the family Eumenidæ. All the described species are enumerated therein, together with the descriptions of many new forms.—G. **Jennison**: Notes on colour-development in the Indian wood-stork (*Pseudotantalus leucocephalus*).—Dr. Ph. **Lehrs**: A new lizard from the Canary Islands, recently discovered by Dr. Cæsar Boettger on Hierro.

Physical Society, May 22.—Dr. A. Russell, vice-president, in the chair.—T. **Barratt** and A. B. **Wood**: Volatility of thorium active deposit. On heating thorium active deposit to accurately measured temperatures up to about 1250° C. it is found that B and C each commence to volatilise at 750° C., but the volatilisation is not complete until 1200° C. is reached. The C curve is peculiar, being similar to two of the B curves placed end to end, the inflexion occurring between 750° C. and 900° C., where about 35 per cent. of the α activity is removed. When measured by β radiation, C is not volatile until a temperature of 900° C. is reached. D commences to volatilise at 500° C. It is assumed that the part of C which produces β rays, viz., C_β, is a separate product, which is not so readily volatile as C_α.—H. P. **Walmsley** and Dr. W. **Makower**: The passage of α particles through photographic films. Kinoshita has shown that when an α particle strikes a grain of silver halide, that grain is subsequently capable of photographic development. It seemed probable that the path of an α particle projected tangentially to a photographic film should, after development, be visible under a microscope. This was shown to be the case, and photomicrographs showing the tracks of α particles through a photographic plate have been obtained.—S. **Butterworth**: A null method of testing vibration galvanometers. By extending the theory of the vibration galvanometer it is shown how the constants may be determined by methods which involve only the measurements of one deflection. The remaining measurements are carried out on an alternating-current bridge. The principle of the method depends on the fact that a vibration galvanometer behaves as a parallel combination of a conductance, a capacity and an inductance, in series with a resistance.—C. W. S. **Crawley** and Dr. S. W. J. **Smith**: Experiments with an incandescent lamp. The first experiment was due to Mr. Addenbrooke who, using a 100-volt lamp filled with paraffin oil as a high resistance in a 200-volt circuit, noticed that some of the bubbles forming on the filament behaved in a curious way. Instead of rising at once to the surface they ran down the legs of the filament, against gravity, and escaped at the leading-in wires. Dr. Smith, repeating the experiment, discovered another striking phenomenon. Placing the 100-volt lamp in a 100-volt circuit in series with a variable resistance it was found possible to obtain a single bubble upon the wire. Instead of escaping at either terminal, the bubble travels backwards and forwards between the two, "looping the loops" of the filament during every journey. A rapid fall of temperature from the wire through the liquid, in the region through which the bubble moves, is an essential condition of the phenomenon.

DUBLIN.

Royal Dublin Society, May 26.—Prof. W. Brown in the chair.—Prof. G. H. **Carpenter**: Injurious insects and other animals observed in Ireland during the year 1913. The more noteworthy records are larvæ of Bibionidæ feeding in potato tubers, and the presence of all three species of apple Aphis—*A. pomi, A. sorbi,* and *A. fitchi*—in Ireland. Observations and experiments by T. R. Hewitt on the infestation of narcissus bulbs by eelworms (Tylenchus) and their migration through the soil are described. Copper sulphate in weak solution (5–7½ per cent.) is safe and effective for soaking the bulbs. A mature larva of Hypoderma extracted from the back of a mare may be confidently

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